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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/042,681	03/12/98	ISHIDA A	MAT-5870

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LAWRENCE E ASHERY
RATNER & PRESTIA
ONE WESTLAKES BERWYN
P O BOX 980 SUITE 301
VALLEY FORGE PA 19482

EXAMINER	
CREPEAU J	
ART UNIT	**PAPER NUMBER**
1745	17

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/042,681	ISHIDA ET AL.	
	Examiner	Art Unit	
	Jonathan S. Crepeau	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 March 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☒ Notice of References Cited (PTO-892)
16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
18) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
19) ☐ Notice of Informal Patent Application (PTO-152)
20) ☐ Other:

DETAILED ACTION

Response to Amendment

1. This Office action is responsive to the CPA filed on March 22, 2001 and addresses claims 16-30. Claims 16-21 and 26-30 remain rejected under 35 USC §103 for essentially the reasons of record, and claims 22-25 are newly rejected under 35 USC §103 as necessitated by amendment. This action is non-final.

Claim Rejections - 35 USC § 103

2. Claims 26-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Peled et al (WO 94/24715) in view of Kawakami (U.S. Pat. 5,888,666) or Blonsky (U.S. Pat. 5,648,011).

Peled et al. teach a lithium polymer secondary battery comprising a positive electrode (made of lithium transition metal compound oxide), negative electrode and polymer electrolyte (separator) on page 6, first paragraph. A ceramic (alumina) not relating to charge and discharge is contained in the electrolyte, which is contained in the anode (see Example 22). The ceramic is granular with a particle size of 0.05-0.5 microns, and is contained in the electrolyte in a quantity of 1-20 volume %. (see page 4, first full paragraph). In Example 22, Peled et al disclose a 6% volume fraction of alumina in the electrolyte, resulting in a the weight percentage of alumina in the alumina/anode active material (coke) mixture of 17.4% (according to the examiner's calculations using densities obtained from the *Prokon* software package of 3.965 and 2.1 g/cc for

alumina and coke (amorphous carbon), respectively). Peled et al. further teach that the ceramic (alumina, silica or magnesia) is incorporated in the polymer electrolyte and cathode, as taught on page 4, first and second full paragraphs, and page 6, last sentence of first paragraph (the polymer electrolyte may also be incorporated in the composite cathode). The main component of the composite electrolyte is polyethylene oxide (PEO), as taught on page 5. An organic electrolyte solution dissolving lithium salt is taught on pages 4 and 5.

Peled et al. do not explicitly teach that the polymer electrolyte is a gel. Furthermore, in Example 22, Peled et al. do not explicitly teach a weight percentage of ceramic to (ceramic + active material) under 9.09% (according to the maximum percentage of the instant claims obtained by dividing 10 by (100+10)).

Kawakami teaches a polymer gel that may comprise PEO in the paragraph starting in column 9, line 43.

Blonsky teaches a gelled electrolyte including a gelling agent made of alumina in the abstract.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because either of these references show that the polymer electrolyte of Peled et al could be termed a "gel". Kawakami teaches a number of polymers that are inherently gelled materials, including PEO. Therefore, the artisan may surmise that while Peled et al call their electrolyte a "composite solid electrolyte," the polymer component of the electrolyte is really a gel. Additionally, Blonsky teaches that silica, alumina, and magnesia are all used as gelling agents in an electrolyte. Therefore, the artisan may surmise

that because alumina (a gelling agent) is used in the polymer electrolyte of Peled et al, the electrolyte must then be a gel.

Regarding the claimed range of alumina content, the artisan would realize that the alumina volume percentage in Example 22 could be 1%, based on the broader disclosure of volume percentage on page 4. Carrying out the same calculations as above, this results in an alumina weight percentage of 3.4%, thereby overlapping with Applicant's claimed range. In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of obviousness exists (*In re Wertheim*, 191USPQ 90; *In re Woodruff*, 16 USPQ2d 1934).

Response to Arguments

Applicant's arguments filed March 22, 2001 have been fully considered but they are not persuasive. Applicants allege that "[t]he Office has not asserted that either Peled, Tsukamoto, Blonsky, or the combination thereof discloses or suggests a battery in which ceramic particles are incorporated into the anode." However, the Examiner has asserted at paragraph 2 of the previous Office action (paper #14, mailed January 3, 2001) that Peled et al., in Example 22, teaches the inclusion of ceramic particles into the electrolyte, which is included in anode (thereby also including the ceramic particles in the anode). The Examiner notes that the actual statement of rejection of claims 26-30 appeared in paragraph 4 of that Office action, but the assertion of Peled's teaching appeared in paragraph 2, which was referenced by paragraphs 3 and

4. For the convenience of the Applicants, paragraphs 2 and 4 have been consolidated into the paragraph presented above, and thereby, the rejection is maintained.

3. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Peled et al. in view of Kawakami or Blonsky as applied to claims 26-29 above, and further in view of Tsukamoto et al (U.S. Patent 5,677,084).

Peled et al. do not explicitly teach a positive active material comprising $LiCoO_2$.

In column 6, lines 63-65, Tsukamoto et al. teach a lithium secondary battery comprising $LiCoO_2$ as a positive active material.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would have sufficient motivation to use $LiCoO_2$ as the positive active material of Peled et al. In the cited passage, Tsukamoto et al. teach that $LiCoO_2$ has a high voltage and a large energy density. Accordingly, the artisan would be motivated to use $LiCoO_2$ as the positive active material of Peled et al.

4. Claims 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Angell et al (U.S. Patent 5,849,432) in view of JP 7-153495.

In Example 17 (col. 14, lines 30-50), Angell et al. teach a rechargeable electrochemical cell comprising a carbon anode, an $LiCoO_2$ composite cathode, and a polymer gel electrolyte including an $LiClO_4$ salt and a BEG:LiEC organic solvent. In addition to the $LiCoO_2$, the composite cathode comprises the gel polymer electrolyte.

Angell et al. do not explicitly teach that the composite cathode contains a ceramic (i.e., alumina) not relating to charge and discharge of the battery, or that the cathode is a "negative electrode".

In the abstract, JP 7-153495 teaches a lithium secondary battery comprising a positive electrode containing an $LiMn_2O_4$ active material and a ceramic (alumina) not relating to charge and discharge.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of the Japanese reference to incorporate alumina particles into the composite cathode of Angell et al. In the abstract, the Japanese reference teaches that capacity deterioration of the battery can be prevented by adding the ceramic particles to the positive electrode which comprises a lithium transition metal oxide. Accordingly, the artisan would have sufficient motivation to incorporate alumina particles into the composite cathode of Angell et al.

Regarding the limitation that the "negative electrode" contains the ceramic particles, the artisan would understand that the cathode of Angell et al. could in fact function as a negative electrode, depending on the mode of operation of the battery. During discharge of the battery, the cathode ($LiCoO_2$) would function as a positive electrode, however, during charging of the

battery, it would function as a negative electrode. The anode (carbon material) of Angell et al. would have the opposite functions during charge and discharge. Accordingly, the recitation of the negative electrode containing the ceramic particles is not considered to distinguish over the reference.

Regarding the claimed range of alumina content, the Japanese reference discloses that there are preferably 2 parts of alumina for 87 parts of lithium manganese oxide (on a 100-part basis, this is equal to 2.3 parts alumina for 100 parts $LiMn_2O_4$). Accordingly, since 2.3 falls within Applicant's claimed range of 0.01 to 10, this disclosure is considered to render this limitation obvious.

Regarding the particle size of the alumina, this is a parameter which may be optimized by the artisan to achieve a particular result. For example, by decreasing the particle size, the surface area is increased, which would allow more beneficial interaction within the positive electrode. It has been held that when the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (In re Aller, Lacey, and Hall, 105 USPQ 233).

Response to Arguments

Applicant's arguments filed March 22, 2001 have been fully considered but they are not persuasive. Applicants assert that "[n]either Angell, JP 7-153495, nor the combination thereof discloses or suggest ceramic particles in the negative electrode." However, for the reasons set

forth above (i.e., in a secondary battery, the cathode may function as both a positive and negative electrode), this assertion is not deemed to be persuasive.

5. Claims 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 7-153495.

In the abstract, JP 7-153495 teaches a lithium secondary battery comprising a microporous polypropylene separator and a positive electrode containing an $LiMn_2O_4$ active material and a ceramic (alumina) not relating to charge and discharge. As disclosed in paragraph [0007] of the computer-generated translation, the battery further comprises a nonaqueous electrolyte solution dissolving a lithium salt and a negative electrode containing a carbon material that occludes and releases lithium.

The reference does not explicitly teach that the negative electrode contains the ceramic.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would understand that the positive electrode of the reference could in fact function as a negative electrode, depending on the mode of operation of the battery. As set forth in paragraph 4 above, during discharge of the battery, the cathode ($LiMn_2O_4$) would function as a positive electrode; however, during charging of the battery, it would function as a negative electrode. The anode (carbon material) of the reference would have the opposite functions during charge and discharge. Accordingly, the recitation of

the negative electrode containing the ceramic particles is not considered to distinguish over the reference.

Regarding the particle size and content ranges of the alumina, these limitations are also not considered to distinguish over the reference, for the reasons set forth in paragraph 4 above.

6. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 7-153495 as applied to claims 22-24 above, and further in view of Tsukamoto et al.

JP 7-153495 does not explicitly teach a positive active material comprising $LiCoO_2$.

In column 6, lines 63-65, Tsukamoto et al. teach a lithium secondary battery comprising $LiCoO_2$ as a positive active material.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would have sufficient motivation to use $LiCoO_2$ as the positive active material of JP 7-153495. In the cited passage, Tsukamoto et al. teach that $LiCoO_2$ has a high voltage and a large energy density. Accordingly, the artisan would be motivated to use $LiCoO_2$ as the positive active material of JP 7-153495.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (703) 305-0051. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gabrielle Brouillette, can be reached at (703) 308-0756. The phone number for the organization where this application or proceeding is assigned is (703) 305-5900. Additionally, documents may be faxed to (703) 305-3599.

Any inquiry of general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

STEPHEN KALAFUT
PRIMARY EXAMINER
GROUP 1700

JSC

May 31, 2001